LEDs Meet World: DOE SSL Technology Demonstration Gateway Program

My Ton
Pacific Northwest National Laboratory
2008 DOE Solid State Lighting R&D Workshop
Atlanta, GA
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Outline: DOE SSL Technology Demonstration Gateway Program

- Gateway program description
- A review of the program process
- Progress to date
- Projects pending and other initiatives
- Where to go for more info

Purpose of the SSL Gateway Program

- Identify and assist in the early adoption of products that offer users real value through significant improvements over the current best competing products.
- Introduce new lighting technologies into appropriate applications.
- Provide users an opportunity to evaluate product performance and gain experience with their daily operations.
- Increase the public's awareness of advanced lighting technologies.
- Assist in the formation of "users' groups" for the purpose of information sharing among users with similar needs.
- To capture and share this information through DOE's SSL website.

Gateway Program Scope

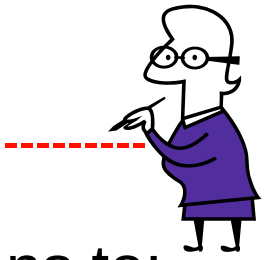
The DOE SSL Technology Demonstration Gateway Program is open to the following eligible* participants:

- Manufacturers or product teams nearing commercialization with their SSL products;
- Demonstration host sites;
- Utilities; and
- Energy Efficiency organizations.

Visit: http://www.netl.doe.gov/ssl/techdemos.htm

Gateway Program Process

- Download the appropriate “Intent to Participate” form for your organization.
- Answer all questions & save a copy for your records.
- Send completed application and any questions to: techdemos@pnl.gov
- Pacific Northwest National Laboratory (PNNL) will review submissions as they are received.
- Applications must be received no later than close of business on May 30, 2008 for demonstration in the first half of 2008.



What's New with the Gateway Program Process

- Applied lessons learned from 2007
- More "streamlined" process:
  - Shorter applications
  - Electronic submission
  - Open-ended application period
- Earlier availability of demonstration results: posting of long-term results on line on a regular basis
- Make sure that the demonstrations are on a fast track
- Demonstration checklist for other participants: parties can conduct their own demonstration without waiting for DOE
- Not "moving at government speed"

Progress to Date

- Street lighting project with the City of Oakland and PG&E completed – report posted on DOE website.
- Walkway/area lighting project at FAA office in New Jersey nearly complete – report under preparation.
- Outdoor lighting project with USPS is in process, with team and product selected.
- Significant interests from the Federal and private sectors, including the Armed Forces and various utilities.
- A number of submitted products were tested at independent laboratories.

"Round 1" Demonstrations: Select Results

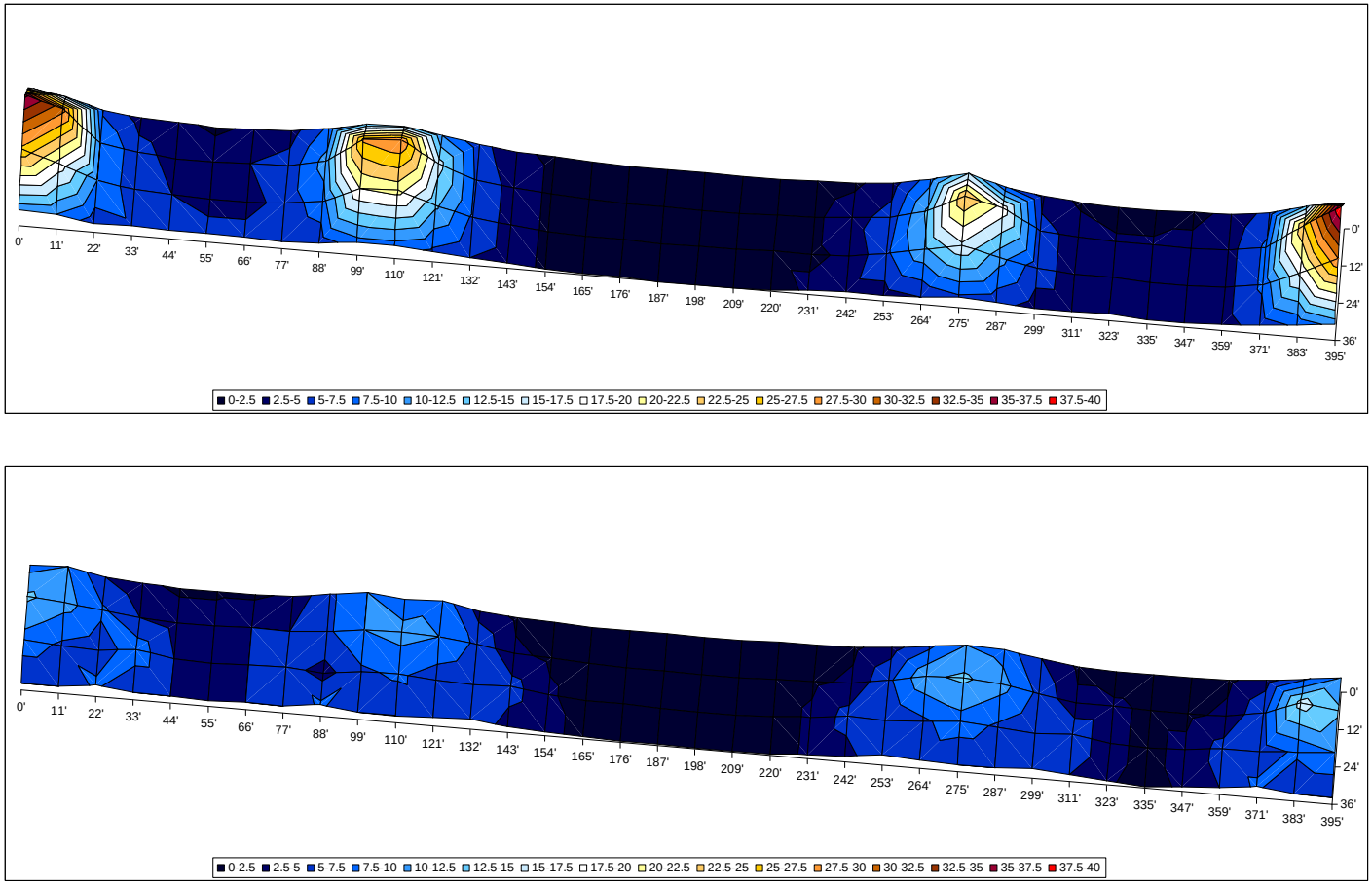
- Well designed SSL products can outperform incumbents

Measured Circuits	Average Illuminance (fc)	Max Illuminance (fc)	Min Illuminance (fc)	Avg. to Min. Uniformity Ratio	Max. to Min. Uniformity Ratio
HPS (Entire Test Area)	0.67	3.72	0	>14.49:1	>80.00:1
LED (Entire Test Area)	0.45	1.49	0	>9.64:1	>32.00:1
HPS (110' Spacing)	1.00	3.53	0.19	5.40:1	19.00:1
LED (110' Spacing)	0.58	1.21	0.19	3.11:1	6.50:1
HPS (120' Spacing)	0.80	3.72	0.09	8.66:1	40.00:1
LED (120' Spacing)	0.53	1.49	0.09	5.68:1	16.00:1
HPS (165' Spacing)	0.47	2.79	0	>10.16:1	>60.00:1
LED (165' Spacing)	0.35	1.21	0	>7.47:1	>26.00:1

Source: PG&E

"Round 1" Demonstrations: Select Results

Light Distribution: LEDs versus HPS



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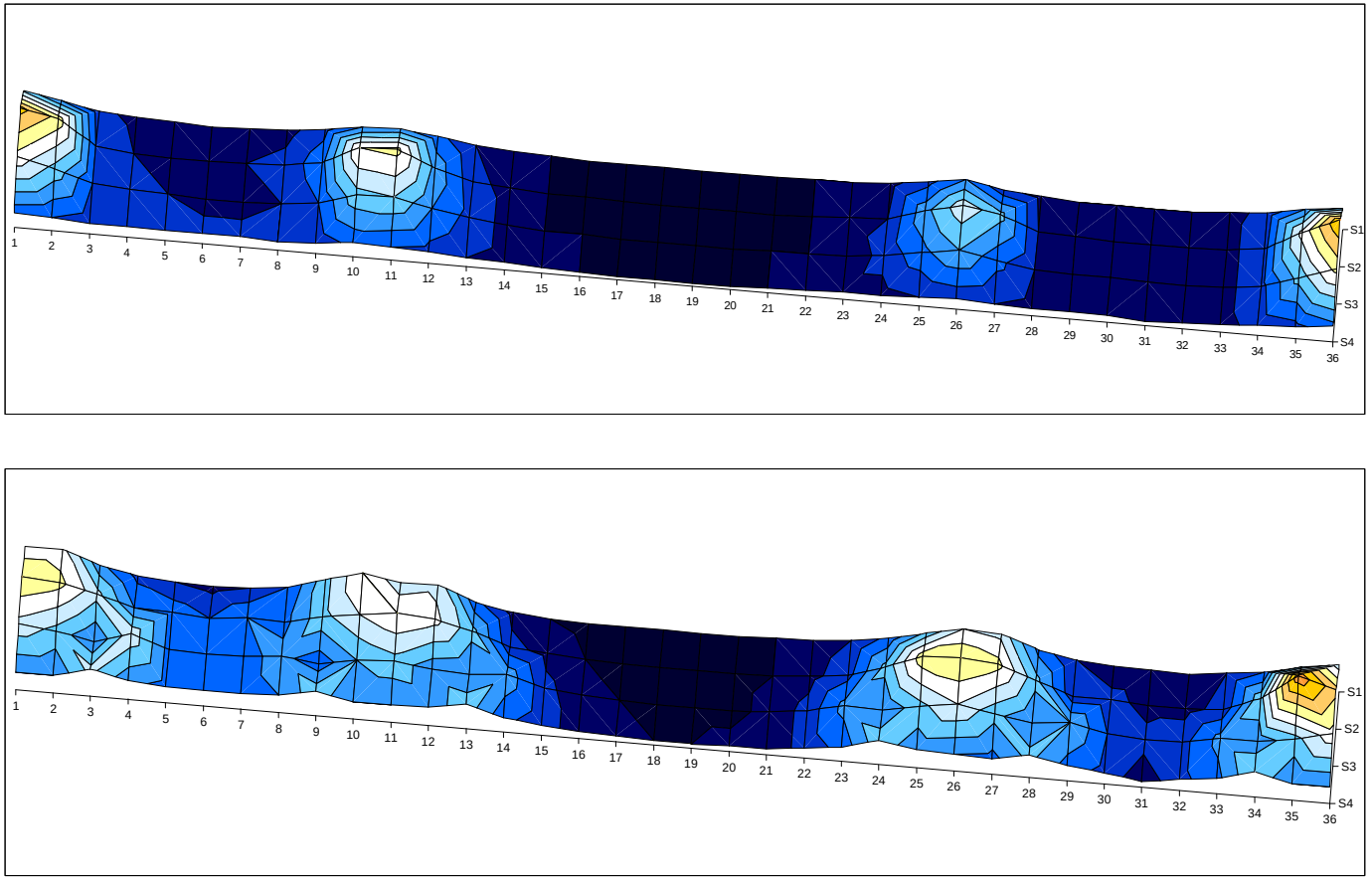


Source: PG&E

"Round 1" Demonstrations: Select Results

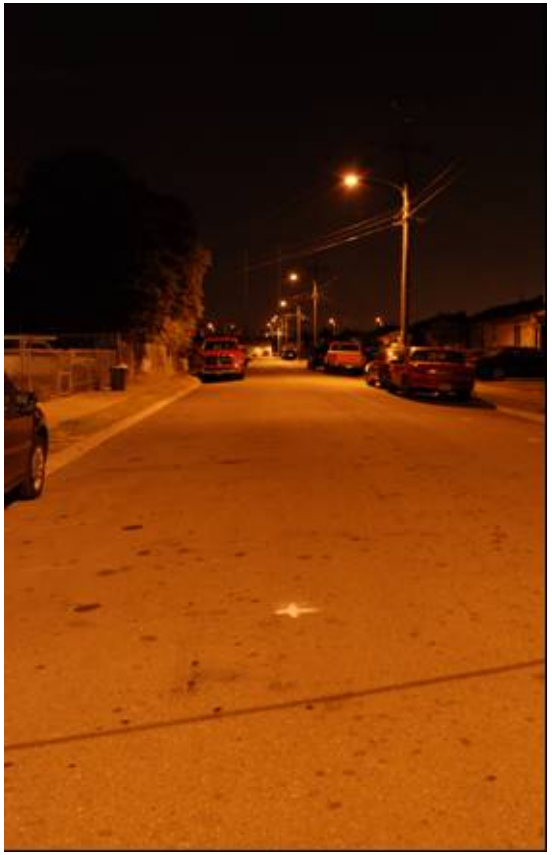
Color Correlated Temperature: LEDs versus HPS

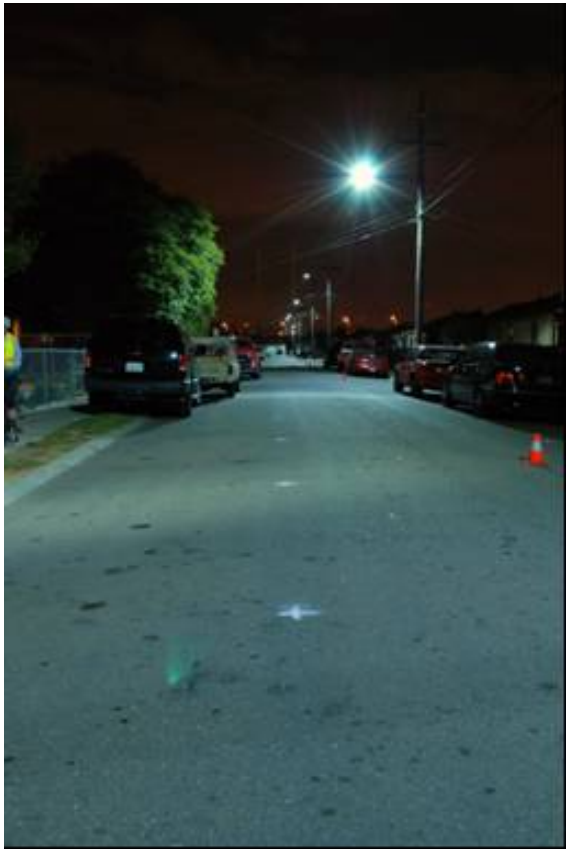
	HPS Luminaires	LED Luminaires
Sample 1	1851	6284
Sample 2	1965	6212
Sample 3	2156	6269
Average	***1991***	***6255***

Source: PG&E

"Round 1" Demonstrations: Select Results

Appearance: LEDs versus HPS





Source: PG&E

"Round 1" Demonstrations: Select Results

Customer Preference: LEDs versus HPS

Preference	Number of Respondents
Strongly Prefer New Streetlights	12
Somewhat Prefer New Streetlights	2
Total Preferring New Streelights	***14***

Preference	Number of Respondents
Strongly Prefer Old Streetlights	0
Somewhat Prefer Old Streetlights	3
Total Preferring Old Streetlights	***3***

Preference	Number of Respondents
No Expressed Preference	***3***

Source: PNNL

"Round 1" Demonstrations: Select Results

Customer Preference: LEDs versus HPS

The new streetlights have…	Overall Appearance	Nighttime Safety	Nighttime Visibility
Strongly improved or somewhat improved	15	14	16
Strongly worsened or somewhat worsened	0	0	0
No noticeable impacts	5	6	4

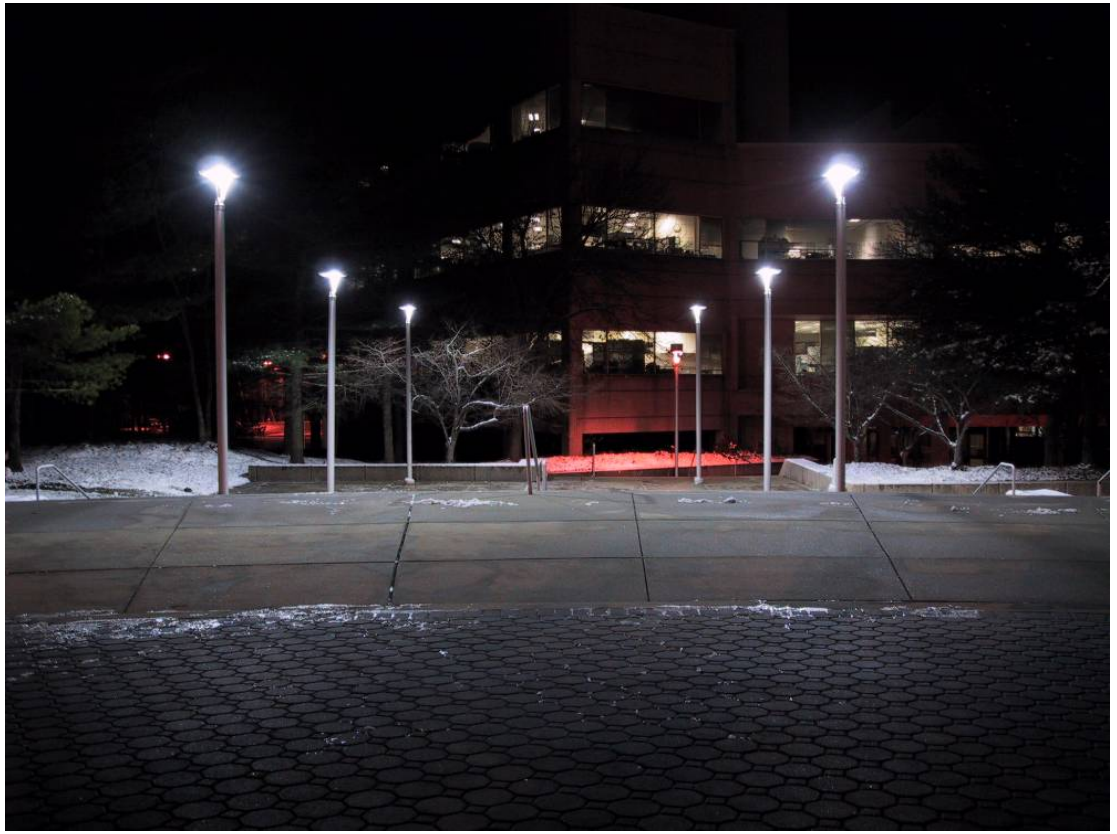
Source: PNNL

"Round 1" Demonstrations: Select Results

Appearance: LEDs versus HPS

Source: FAA

"Round 1" Demonstrations: Select Results



Source: FAA

"Round 1" Demonstrations: Select Results

Customer Preference: LEDs versus HPS

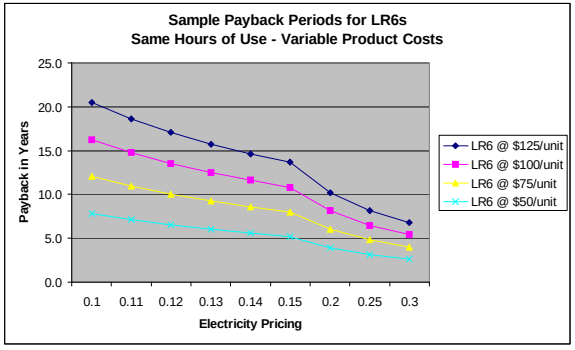
Rating Category	Average Rating (1 to 5)
Overall night-time visibility in the area where the lights are installed.	4.36
Ability to navigate the stairs at night.	4.23
Ability to recognize faces at night.	4.24
The presence of unwanted glare.	3.84
Adequacy of the amount of light.	4.41
Depth and appearance of shadows.	4.08
Overall appearance of the building and site at night.	4.35
Overall perception of safety in the area surrounding the lights.	4.29
My overall opinion of the lighting in this area is that it has been improved	4.48

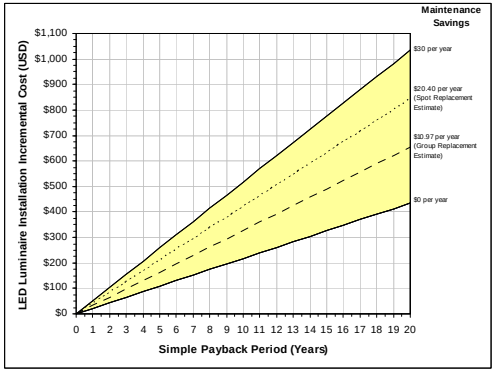
Source: PNNL

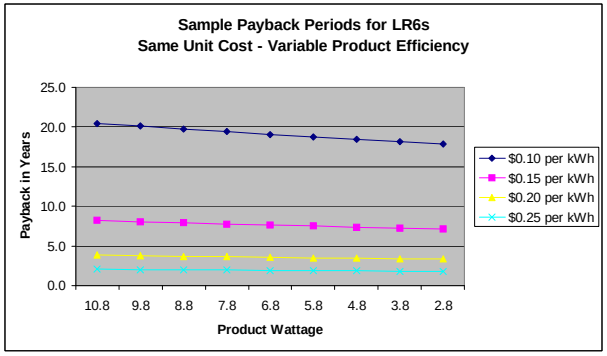
"Round 1" - Other Observations

Economics is key:

- Product costs remain a challenge
- High hours of use, increasing cost of electricity can help
- Need accurate information on maintenance costs for realistic comparisons







"Round 2" Status

- 4 to 6 applications per month (so far)
- Projects under development include:
  - Parking garage
  - Residential downlights
  - Undercabinet lighting
  - Other outdoor applications
- "Users Groups" forming
- Possible development of a "Demonstration Registry"

HID Lights: Energy Savings Potential of LEDs

- Based on U.S. Census, the estimated inventory of these fixtures is 34 million street lights and 76 million area and parking lot lights in 2007.

Application Technology	Annual Electricity Consumption (TWh/yr)	Energy Savings from LEDs (TWh/yr)*	Primary Energy Savings* (TBtu/yr)	Equivalent Households+ (millions)
Baseline HID Technologies	164.5	--	--	--
LED System (56 lm/W)	129.5	35.0	379.4	2.9
LED System (future:120 lm/W)	61.5	103.0	1,115.9	8.5

•Savings are the "technical potential", which assumes every fixture in the inventory converts to LED overnight at the efficacy given.

•+Equivalency is based on the electricity consumption of a typical residential household.